A short note on the intensity of grazing of the Serengeti plains by plains-game

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The Serengeti National Park has attracted more ecological research than any other area in East Africa, and from the works of Pearsall (1957), Grzimek & Grzimek (1960), and Talbot & Talbot (1963), a good background of information is available. This short note describes one of the problems of the Serengeti which the Serengeti Research Project is investigating.

The Serengeti Plains — a grassland complex

The first classification of the Serengeti plains vegetation was into three physiognomic types; the eastern short grass zone, the central transitional grass zone, and the western long grass zone. Greenway (1962) has given more detailed descriptions of these grassland types, and our present knowledge is summarised in Fig. 1.

Rainfall, soils, topography and drainage, wild animals, and in parts of the plains outside the National Park, domestic stock, are all obviously contributing to maintaining or changing this grassland complex. It is not possible at this stage to define the findings of Pearsall and Grzimek (loc. cit.). The hard calcareous pan which gauges and by regularly recording relative humidity, the Serengeti Research Project has established data which support the conjectures of previous workers, namely that there is an approximately east to west gradient of increasing rainfall and increasing relative humidity.

Work on the soils (Kerfoot, 1963; Anderson, 1963) have confirmed and extended the findings of Pearsall and Grzimek (loc. cit.). The hard calcareous pan which underlies the short grasslands at depths of 2—3 ft. (65—100 cm.), is found under much of the transitional grassland at depths from 4—8 ft. (140—270 cm.), but is absent from the long grasslands.

The shallow structureless soils of the short grasslands will have lower moisture retention than the soils of the transitional grasslands, and likewise the very deep soils of the long grasslands will have a higher moisture retention than the soils of the transitional grasslands. Work performed on the rooting patterns also suggests that the depth of the calcareous pan, through its influence on moisture availability, may be a very significant soil feature. An east to west gradient of decreasing soluble salt content of the soils has also been noted. A series of exclosure plots have been set up in May 1962, to give indications of the part played by the grazing game in maintaining the grassland complex.

The grazing density

This section of the research would prove quite impossible without the use of the Tanganyika National Park's aircraft. Observations have been made two or three times a week by Park Warden Turner and the first author, of the position and numbers

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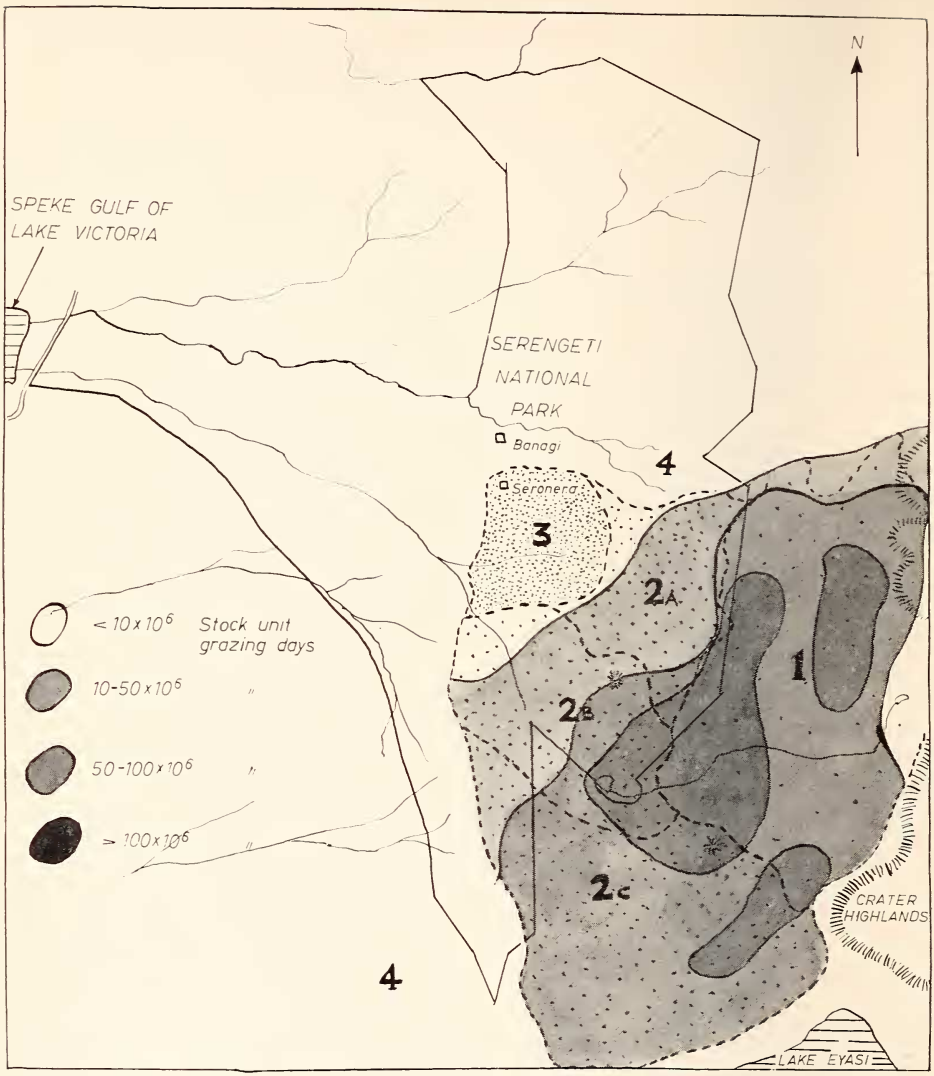

Figure 1. Grassland types

1. Short grassland composed of perennial grasses with about 70% cover. *Cynodon dactylon, Sporobolus marginatus, Digitaria macroblaphera, Cyperus costatus, Microchloa kunthii,* are the dominants. In grazed areas the height rarely exceeds four inches.

2. Transitional grasslands, subdivided as 2A, 2B and 2C. These rarely exceed a height of two feet.

2A. Transitional grassland composed of perennial grasses and herbs, and some annual grasses, with about 70% cover (basal). *Pennisetum mezianum, Chloris pycnothrix, Sporobolus* sp., *Harpachne schimperi,* are locally dominant. *Crotalaria spinosa, Indigofera baseflora,* and *Heliotropium stuedeneri* are typical of type 2A, especially on the slight slopes. *Themeda triandra,* although not a dominant, occurs throughout.

2B. Transitional grassland composed of perennial and annual grasses, and some herbs, with about 60% cover. *Andropogon greenwayii, Pennisetum mezianum, Cynodon dactylon, Pennisetum stramineum,* and *Sporobolus* sp. are the dominants, and occur in a typical mozaic pattern. *Crotalaria spinosa, Indigofera baseflora, Heliotropium* sp. and *Leucus* sp. are found,

as in type 2A. *Themeda triandra* and *Setaria* sp. may be locally dominant in the west of 2B grassland.
2C. Transitional grassland composed of perennial grasses and herbs, and some annual grasses. *Cynodon dactylon, Chloris pycnothrix, Themeda triandra, Sporobolus* sp., *Brachyaria* sp., *Eragrostis* sp., and *Panicum* sp. are the dominants. *Setaria* sp. is a dominant in the west of the area. *Indigofera baseflora* and *Heliotropium stuedeneri* occur, but are much less important components than in types 2A and 2B.
3. Long grasslands made up of *Pennisetum mezianum* and *Themeda triandra* as dominants. These grasslands reach a height of four feet after the wet season.
4. Open woodland with *Acacia* spp. and *Commiphora* sp.

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of plains game. The Serengeti plains are grazed from December to June approximately, and the intervening period sees them relatively untouched. The intensity of grazing for the years 1961—1963 is shown in Fig. 1.

The three herbivore species involved in these observations are wildebeeste *(Connochaetes taurinus albojubatus)*, zebra *(Equus quagga boehmi)*, and Thomsons gazelle *(Gazella thomsonii thomsonii)*. The numbers of these animals based on previous counts, and on yet unpublished counts of 1963 are:

wildebeeste: more than	300,000
zebra:	150,000
gazelle:	600,000

(It should be noted that wide fluctuations are possible in these numbers over a period of a few years because of the high fecundity of these species).

Some thousands of grant's gazelle *(Gazella granti robertsi)*, eland *(Taurotragus oryx pattersonianus)*, hartebeeste *(Alcelaphus buselaphus cokei)*, and topi *(Damaliscus korrigum)*, are found with the three major species, but constitute such a small proportion of the grazing biomass that they are ignored for the purposes of this paper.

All the plains game species show a marked preference for the short grass and transitional grass, as was first noted by Grzimek & Grzimek (1960). The long grassland is grazed for a short time at the end of the wet season as the game moves westward to the dispersal areas, and again shortly at the start of the rains. Wildebeeste show the most marked avoidance of the long grass zone, and they pass through it in less than one week. Zebra are seen to graze long grassland for two to three weeks, and these areas are notably the ones later used by wildebeeste. Gazelle use some parts of the long grass zone, especially after the passage of zebra and wildebeeste has taken off some of the length, for up to two months.

The post-burn flush on the long grassland is more attractive to all species, and will hold the returning game at the start of the rains for three to four weeks, but *only* if the short and transitional grasslands have had insufficient rain to bring them into grazing condition. There is no difference between the three grassland types in the availability of rain-water pools for drinking, through most of the wet season. At the start and end of the rains the long grassland has more available drinking water than the short and transitional types.

Table 1

Intensity of grazing in 1,000,000. s(ie 10^6) of stock unit grazing days

	Long grass	Transitional grass	Short grass
Gazelle	3.6	3.6	7.2
Zebra	4.0	14.0	32.0
Wildebeeste	2.1	6.0	44.0
Total	9.7	23.6	83.2

Table 1 summarises the difference in grazing intensity of the grassland types in terms of stock unit grazing days. For convenience a stock unit is taken as an animal of about 400 lbs = 180 kg.

The Serengeti ecological unit and the boundaries of the Serengeti National Park

A glance at Fig. 1 will demonstrate that more than three quarters of the wet season grazing lies outside the boundaries of the Serengeti National Park.

Moreover the apparently preferred grassland types are mainly outside the Park boundaries. It will be important for the future of the Serengeti ecological unit to establish what features in the preferred grasslands are significant in the creation of the preference, and to find out how essential these features are for the continued existence of the Serengeti herds.

The situation is made more critical in that wildebeeste calving takes place generally outside the Park on the short and transitional grasslands.

The inviability of the Serengeti National Park, within its present boundaries was first pointed out by Grzimek & Grzimek (1960), and the authors' findings confirm this.

Summary

1. A short description of the grasslands complex of the Serengeti plains is made, and some soil and climatic factors mentioned.
2. The year-round grazing-density of plains game on the Serengeti plains is recorded.
3. The apparent preference of the plains game for the short, and parts of the transitional, grassland is noted.
4. A comment on the viability of the Serengeti National Park in the light of these findings, is made.

Zusammenfassung

1. Die Grasländer der Serengeti werden kurz beschrieben, einige Boden- und Klimafaktoren werden erwähnt.
2. Die Weidedichte der Steppentiere der Serengeti wird das ganze Jahr über protokolliert.
3. Es wurde festgestellt, daß die Steppentiere kurzes, teilweise auch mittellanges Gras als Weide bevorzugen.
4. Die Ergebnisse werden zur Beurteilung der Lebensmöglichkeiten der Tiere des Serengeti National Parks verwertet.

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